

JC685 U.S. PTO



06/23/00

REQUEST FORM FOR APPLICATION UNDER 37 CFR 1.53(b)

JC714 U.S. PTO

09/599552



06/23/00

DOCKET NUMBER: 041-1972A
Prior Application: 08/956,585
Art Unit: 2714
Examiner: P. Natnael

Assistant Commissioner for Patents
Washington, DC 20231

Sir:

This is a Request for filing a Continuation application under 37 CFR 1.53(b) of pending prior application Serial No.

08/956,585, filed on October 23, 1997, entitled DIGITAL BROADCASTING SYSTEM USING VIRTUAL CHANNELS, by the

following named inventors: Ryota TSUKIDATE et al.

1. ☒ I hereby state that the enclosed application is a true copy of the above-identified prior application Serial No. 08/956,585.

2. Oath or Declaration

- a. ☐ Newly executed (original or copy)
b. ☒ Copy from a prior application (37 CFR 1.63(d))
i. ☐ Deletion of inventor(s)
Signed statement attached deleting inventor(s) named in the prior application, see 37 CFR 1.63(d)(2) and 1.33(b).

3. ☒ Incorporation By Reference (useable if Box 2b is checked)
The entire disclosure of the prior application, from which a copy of the oath or declaration is supplied under Box 2b, is considered a part of the disclosure of the accompanying application and is hereby incorporated by reference.

4. ☒ Preliminary Amendment is enclosed.

5. ☒ An Information Disclosure Statement and PTO1449 Form are submitted herewith.

6. ☐ Cancel claims .

7. The filing fee is calculated on the basis of the claims existing in the prior application as amended at 4 and 6 above:

	NO. OF CLAIMS		EXTRA CLAIMS	RATE	FEE
Total Claims	9	MINUS 20	0	x \$18 =	\$ 0.00
Independent Claims	3	MINUS 3	0	x \$78 =	\$ 0.00
Basic Application Fee					\$ 690.00
If multiple dependent claims are presented, add \$260.00					\$0.00
Total Application Fee					\$ 690.00
Subtract 1/2 if small entity					\$0.00
TOTAL APPLICATION FEE DUE					\$ 690.00
AMOUNT TO BE CHARGED TO DEPOSIT ACCOUNT NO. 50-120					\$690.00

7a. ☐ Enclosed is a Verified Statement to establish small entity status under 37 CFR 1.9 and 37 CFR 1.27.

7b. ☐ A verified Statement to establish small entity status under 37 CFR 1.9 and 37 CFR 1.27 was filed in prior application and such status is still proper and desired.

8. ☒ The Commissioner is hereby authorized to charge fees under 37 CFR 1.16 and 1.17 which may be required, or to credit any overpayment, to Deposit Account No. 50-1209.

9. ☒ Amend the specification by inserting before the first line the sentence:
--This application is a Continuation of Application Serial No. 08/956,585 filed October 23, 1997.—

10. ☒ Priority of Application Serial No. 8-279756 filed on October 23, 1996 in Japan is claimed under 35 USC 119. The certified priority document(s) were filed in Serial No. 08/956,585 on October 23, 1997

11. ☒ The prior application is assigned of record to MATSUSHITA ELECTRIC INDUSTRIAL CO., LTD.

12. ☒ The power of attorney in the prior application is to:

Israel Gopstein, Registration No.. 27,333 formerly of the former firm of LOWE PRICE LEBLANC & BECKER

13. ☒ Also enclosed:

8 pages of drawings.

14. ☒ A petition, fee and response has been filed to extend the term in the pending prior application until June 23, 2000

Address all future communications to:

Israel Gopstein
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Respectfully submitted,

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Date: June 23, 2000

Docket No.: 041-1972A

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Continuation Application of :
: Ryota TSUKIDATE et al :
: Serial No. : Group Art Unit:
: Filed: Concurrently herewith : Examiner:

For: DIGITAL BROADCASTING SYSTEM USING VIRTUAL CHANNELS

PRELIMINARY AMENDMENT

Assistant Commissioner for Patents
Washington, D. C. 20231

Sir:

Prior to examination, please amend the above identified application as follows:

IN THE SPECIFICATION

Please amend the specification as follows.

- Page 1, line 5, change “verity” to --variety--,
- line 10, change “systems committee” to --Systems Committee--;
- line 15, replace “stand” by --standard--;
- line 18, replace “other” by --another--;
- line 19, before “the”, first occurrence, insert --accordance with-- and replace “the”, second occurrence, by --a--.

Page 2, line 6, after “of” insert --a number of--;

lines 7-8, delete “which is different from the physical channel selected by the broadcaster”;

line 8, before “programs” insert --the--;

line 12, rewrite “a channel (or a program)” as --a program--; delete “the”;

line 13, replace “channel” by --a program--; replace “is intended” by -- record is intended or a channel through which the program to be received is transmitted. In other words, a CMI includes either a program or a channel ID as mapping destination.--;

line 14, after “schedule” insert --(i.e., at predetermined times for respective programs)--;

line 15, replace “have” by --has--;

line 18, replace “is” by --are--;

Page 3, line 9, change “form” to --from--;

line 27, delete “for”.

Page 4, line 8, replace “stream” by --streams--.

Page 8, line 8, change “form” to --from--.

Page 10, line 7, change “FIG. 6” to --FIG. 8--.

Page 11, line 25, change “60” to --600--.

IN THE CLAIMS

Please amend the claims as follows.

1 (Amended). A digital broadcasting system capable of causing one of physical channels selected by a broadcaster to be received as one of the channels available to users [which is different from the physical channel selected by the broadcaster]; the system comprising:

5 means for storing, for each of programs of each of said channels available to said users, a program information record comprising PSI (program specific information);

means for permitting the broadcaster to include, in said PSI, channel mapping information whose mapping designation is [a channel (or) a program[]]
10 to be received instead of [the channel] a program for which said program information record is intended or a channel through which said program to be received is transmitted; and

means for inserting said program information records in broadcast transport streams on schedule and, if necessary, immediately after said broadcaster [have]
15 has included said channel mapping information in said PSI data.

2 (Amended). A system as defined in claim 1, further comprising:

means, responsive to a determination that PSI data for said program to be received includes channel mapping information indicative of a third [channel (or program)] program or channel to be received, for changing said channel mapping

- 5 information such that the mapping destination of said channel mapping information is said third [channel (or program)] program or channel.

4 (Amended). In a digital broadcasting system in which a broadcasting center provides broadcast services through a plurality of physical channels which actually transmit service programs, a method for causing one of [the] physical channels selected by a broadcaster to be received as one[,] of the channels

- 5 available to users[, which is different from the physical channel selected by the broadcaster]; the method comprising the steps of:

storing, for each of programs of each of said channels available to said users, a program information record comprising PSI (program specific information);

- 10 including, in said PSI for a program said broadcaster desires to be received, channel mapping information whose mapping destination is a [channel (or) a program[]] to be received instead of [the channel] a program for which said program information record is intended or a channel through which said program to be received is transmitted; and

- 15 inserting said program information records in broadcast transport streams on schedule and, if necessary, immediately after said broadcaster [have] has included said channel mapping information in said PSI data.

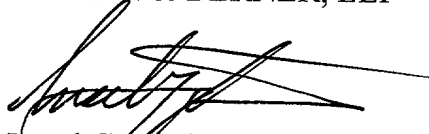
REMARKS

The foregoing amendment places the application in conformity with the parent application.

Entry prior to examination is courteously solicited.

Respectfully submitted,

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DIGITAL BROADCASTING SYSTEM USING VIRTUAL CHANNELS

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a digital broadcasting system which permits the users to receive a verity of services not only through a limited number of physical channels through which program data are actually transmitted but also through one or more virtual channels.

2. Description of the Prior Art

Virtual channels have been proposed in the ATSC (Advanced Television systems committee) standard published in 1996. According to the standard, virtual channels offer the user a constant view of services available on any particular transport stream (TS) compliant with the standard. The virtual channels are specified in the virtual channel table (VCT) whose records are transmitted with service data.

If a receiver used in a broadcasting system compliant with the standard is turned on after such a long interval that the stored VCT is no longer effective, the normal operation of the receiver will not be guaranteed. Also, in the broadcasting system, any channel can be changed to other physical channel only in the timing defined in the VCT. However, the broadcaster may desire to change one or more channels to any other physical channel or a specific physical channel during ongoing programs of the one or more channels for some reason, e.g., alternative broadcasting in case of a trouble in any of program source systems in the broadcasting center or announcing the highlight of ongoing program of the specific physical channel.

It is therefore an object of the invention to provide a digital broadcasting system which utilizes virtual channels interchangeable at any time by frequently inserting channel shift information into each of the

transport streams broadcast from a broadcasting center.

It is another object of the invention to provide some forms of digital broadcasting systems using virtual channels.

SUMMARY OF THE INVENTION

5 A digital broadcasting system according to the principals of the invention can cause one of physical channels selected by a broadcaster to be received as one of the channels available to users which is different from the physical channel selected by the broadcaster. For each of programs of each of the channels available to said users, a program information record comprising
10 PSI (program specific information) is stored in a data base. The broadcaster is permitted to include, in the PSI, channel mapping information (CMI) whose mapping destination is a channel (or a program) to be received instead of the channel for which said program information is intended. The program information records is inserted in broadcast transport streams on schedule
15 and, if necessary, immediately after the broadcaster have included the channel mapping information in the PSI data.

Some strategies of selecting a series of programs for a virtual channel is proposed.

BRIEF DESCRIPTION OF THE DRAWING

20 Further objects and advantages of the present invention will be apparent from the following description of the preferred embodiments of the invention as illustrated in the accompanying drawing, in which:

FIG. 1 is a schematic block diagram showing an illustrative embodiment of a broadcasting center system in accordance with the principles
25 of the invention;

FIG. 2 is a diagram showing the contents of a hard disc within the microcomputer 20 of FIG. 1;

FIG. 3 is a schematic diagram showing an arrangement of a program information record;

FIG. 4 is a flow chart showing the operation of the microcomputer 20 of FIG. 1 which is performed in response to an alteration to the data base 22;

5 FIG. 5 is a flow chart showing the operation of the transmission controller 50 in controlling the data buffer 30 in response to a reception of PSI and SI/EPG data from the computer 20;

FIG. 6 is a diagram illustrating how a virtual channel CH_j is configured from the physical channels CH_1 through CH_M ;

10 FIG. 7 is a diagram showing an exemplary channel mapping state in which the physical channel CH_1 is further mapped to the physical channel CH_4 during a period from about 8:35 to 8:50 in a situation (or a program configuration) shown in FIG. 6;

15 FIG. 8 is a schematic block diagram showing an arrangement of an illustrative embodiment of a receiver in accordance with the principles of the invention; and

FIG. 9 is a diagram showing an exemplary channel configuration broadcast from a broadcasting center in accordance with the principles of the invention.

20 Throughout the drawing, the same elements when shown in more than one figure are designated by the same reference numerals.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

25 FIG. 1 is a schematic block diagram showing an illustrative embodiment of a broadcasting center system in accordance with the principles of the invention. In FIG. 1, the broadcasting center system 1 comprises a plurality of M program source devices (CHANNELs 1 through M) 10 for each

providing a MPEG stream for a broadcasting program on air through the channel, a microcomputer 20 and user interface 29 for preparing and storing PSI (Program Specific Information described later) data and SI/EPG (Service Information/Electronic Program Guide) data, a data buffer 30 for supplying the

5 PSI and SI/EPG data such that the launched data are multiplexed with the MPEG streams from the program source device 10, a transmission unit 40 for multiplexing the MPEG streams and the SI/EPG data into a plurality of N multiplexed MPEG transport stream ($N < M$), and a transmission controller 50 for controlling the data buffer 30 and the transmission unit 40. The

10 microcomputer may be any suitable conventional computer. FIG. 2 is a diagram showing the contents of a hard disc within the microcomputer 20. The hard disc 21 at least stores a data base 22 of broadcasting program information, a DBMS (data base management system) 23 for creating and maintaining the data base 22, and a PSI and SI/EPG data compiler 24 for

15 compiling data in the data base 22 into PSI data and SI/EPG data.

In operation, the operator of the system 1 creates and stores in the data base 22 a program information record for each of the programs in a predetermined period for each of the physical CHANNELs 1 through M and virtual channels, say, CHANNELs M+1, M+2,..., M+V (V is the number of

20 virtual channels and is equal to or larger than one). In this case, a physical channel (or virtual source) is an actual channel through which broadcasting data are transmitted from a real program source, whereas a virtual channel is an imaginary one but is listed as a program source in a program guide and provides the user with a constant view of programs selected from the

25 programs of the physical channels.

FIG. 3 is a schematic diagram showing an arrangement of the above mentioned program information record. In FIG. 3, the program information

record 300 comprises channel ID field 310, program guide data fields 320, and PSI data fields 330. This program information record 300 is created for each broadcasting program of each channel regardless of whether the channel is a physical one or virtual one. The channel ID field 310 contains an ID of the channel, i.e., CH_i ($1 \leq i \leq M$ for a physical channel) or CH_j ($M+1 \leq j \leq M+V$ for a virtual channel). The program guide data fields 320 contain a program ID 321, a program name 322, the category 323 of the program, start time and date 324, end time and date 325, a channel ID 326, and other descriptive data 327, which are transmitted in a SI/EPG packet. If the program in question is a virtual channel (e.g., CH_j) program, then the program ID and other program guide data are the ID and corresponding data of the program of (physical) channel to be received instead of the program in question.

In a virtual channel (e.g., CH_j) case, the PSI data fields 330 includes channel mapping information (CMI) 335 indicating that the channel (CH_j) is to be mapped to the physical channel (e.g., CH_i) through which the broadcasting program is actually transmitted. Doing this enables broadcasting programs of other channels or sources to be viewed (or listened) as if the broadcasting programs were broadcast by the virtual channel or source. In a physical channel case, the PSI data fields 330 contain conventional PSI data. However, there may be a case when even in a physical channel (e.g., CH_h ($1 \leq h \leq M$)) case, the broadcaster wants the user to use other physical channel (e.g., CH_i ($i \neq h$)) instead of CH_h . In this case, the PSI data fields 330 will include a channel mapping information 335 for mapping CH_h to CH_i .

Thus created program information record 300 is stored once in the data base 23. FIG. 4 is a flow chart showing the operation of programs which comprise the DBMS 23 and the PSI and SI/EPG compiler 24 and are executed by the microcomputer 20 of FIG. 1 in response to an alteration to the data

base 22. FIG. 5 is a flow chart showing the operation of the transmission controller 50 in controlling the data buffer 30 in response to a reception of PSI and SI/EPG data from the computer 20. If any of an addition, an alteration and a deletion of program information record 300 is performed in the data

5 base 22, the computer 20 enters the operation flow of FIG. 4.

If a new program information record 300 has been added to the data base 22 in step 400, the control is passed to step 402, where a test is made to see if the added or new record 300 contains a CMI. If not, then another test is made in step 414 to see if it is after the time to pass the PSI data of the

10 altered record 300 to the data buffer 30. If so, the computer 20 immediately compiles the record 300 into PSI and SI/EPG and passes the compiled data to the data buffer 30 in step 416. Otherwise, the computer 20 compiles the record 300 into PSI and SI/EPG and passes the compiled data to the data buffer 30 on the schedule in step 404. After step 404 or 416, the microcomputer 20 ends the

15 process. Then, in FIG. 5, since there is no corresponding PSI or SI/EPG in the data buffer 30 (in step 502), the controller 50 temporarily stores the received data in the data buffer 30 in step 506. The stored data in the buffer 30 are then passed to the transmission unit 40 on the schedule under the control of the transmission controller 50.

20 However, the broadcaster may desire to change a channel to any other or a specific physical channel during the ongoing program of the channel for some reason. For this purpose, the broadcaster is permitted not only to include a CMI 335 in a new program information record 300 but also to add a CMI 335 to any program information 300 stored in the data base 22 and/or to

25 change or delete any channel mapping information in any program information 300 as long as the broadcasting of program specified by the program information 300 has not been finished. That is, if a CMI is included in the new record 300 in step 402, if a CMI has been added to any program

information record 300 stored in the data base 22 in step 406, or if the CMI of any program information record 300 stored in the data base 22 has been changed or altered in step 408, the control is passed to step 410 to search the data base 22 for records 300 which contain CMIs whose mapping destinations
 5 are the program described by the new or altered record 300. Then, in step 412, the computer 20 changes the CMIs of the found records 300 such that the mapping destinations of the found record 300 CMIs are the same as that of the new record 300 and proceeds to step 414. In step 414 the computer 20 makes a test for each of the changed records 300 to see if it is after the time to pass the
 10 PSI data of the altered record 300 to the data buffer 30. If so, the computer 20 immediately compiles each record 300 into PSI and SI/EPG and passes the compiled data to the data buffer 30 in step 416. Otherwise, the computer 20 compiles each record 300 into PSI and SI/EPG and passes the compiled data to the data buffer 30 on the schedule in step 404. After step 404 or 416, the
 15 computer 20 ends the process.

In FIG. 5, in response to a reception of PSI and SI/EPG data from the computer 20, the transmission controller 50 makes a test in step 500 to see if there is, in the data buffer 30, PSI and SI/EPG for the same program that the received PSI is intended for. If so, the computer 20 writes the received PSI and
 20 SI/EPG over the existing ones in the buffer 30. Otherwise, the computer 20 stores the received PSI and SI/EPG in the buffer 30. By doing this, the broadcaster can change any channel to other channel substantially in real time.

In either case, the stored data in the buffer 30 are then passed to the
 25 transmission unit 40 on the schedule for multiplexing under the control of the transmission controller 50.

On the other hand, the M broadcasting data stream from the source device 10 are grouped and multiplexed into N time-division multiplexed

transport streams ($N < M$) in the transmission unit 40 under the control of the transmission controller 50. In the multiplexing process, SI/EPG data and PSI data are inserted into the N transport streams in a well-known manner.

In this way, digital broadcasting services are provided not only through physical channels but also through virtual channels according to predetermined program schedules.

FIG. 6 is a diagram illustrating how a virtual channel CH_j is configured from the physical channels CH_1 through CH_M . It is assumed in FIG. 6 that the virtual channel CH_j has 6:00-7:00, 7:00-9:00, 9:00-10:00, 10:00-11:00, 11:00-11:30, assigned thereto as program hours $Pj-1$, $Pj-2$, $Pj-3$, $Pj-4$, $Pj-5$,..., respectively, after 6:00 of some day and that the programs of some physical channel CH_i ($1 \leq i \leq M$) after 6:00 of the same day are $Pi-1$, $Pi-2$, $Pi-3$,.... In this example, the program hours of the virtual channel CH_j are mapped to physical channel programs as shown in the following table.

Table

Start Time	CH _j Program Hours (Imaginary Programs)	Substitution Programs
6:00	Pj-1	P3-1
7:00	Pj-2	P1-2
9:00	Pj-3	P5-4
10:00	Pj-4	P3-4
11:00	Pj-5	P2-5
11:30	Pj-6	P4-6
.	.	.
.	.	.
.	.	.

Specifically, the PSI data transmitted for CH_j during the time period from 6:00 to 7:00 includes data indicative of the channel CH_3 or the program P3-1 as the channel mapping information 335, similarly the CH_j PSI data from 7:00 to 9:00 includes data indicative of CH_1 or P1-2, the CH_j PSI data

from 9:00 to 10:00 includes data indicative of CH₅ or P5-4, and so on. In other words, each of the vertical arrows of FIG. 6 shows a channel mapping information which is stored in the PSI associated with the program where the arrow is originating and which indicates that the arrow originating program is mapped to the program pointed by the arrow, i.e., the channel pointed by the arrow is received.

(A program used as a virtual program (shown as pointed by an arrow in FIGs. 6 and 7) is hereinafter referred to as a "substitution program" and a physical channel carrying such a substitution program is referred to as a "substitution channel".)

FIG. 7 is a diagram showing an exemplary channel mapping state in case when the physical channel CH₁ is further mapped to the physical channel CH₄ during a period from about 8:35 to 8:50 in a situation (or a program configuration) shown in FIG. 6. The channel mapping state of FIG. 7 is identical to that of FIG. 6 except that the physical channel CH₁ is mapped to the physical channel CH₄ during a period from about 8:35 to 8:50. However, it should be noted that the channel CH_j or Pj-2 has been already mapped to the channel CH₁ or P1-2. In this case, two mapping ways concerning the channel CH_j are possible for the period from 8:35 to 8:50. One is to map CH_j to CH₁ during the period as well as the other period of Pj-2, thereby double-mapping CH_j to CH₁ and then to CH₄. The other is to map CH_j directly to CH₄. In order to avoid making the receiver structure complicated, the latter mapping way has been used in this illustrative embodiment.

In this way, if a substitution program for some program (an original program) is to be further mapped to another substitution program (a second substitution program), then the channel mapping information (CMI) of the original program is changed such that the mapping destination of the CMI of

the original program is the second substitution program. For example, if CH₁ (or P1-2) is mapped to CH₄ (or P4-3) during the period from 8:35 to 8:50 in a state shown in FIG. 6, then the mapping destination of the CMI for CH_j is changed from P1-2 to P4-3 only during the period.

FIG. 8 is a schematic block diagram showing an arrangement of an illustrative embodiment of a receiver in accordance with the principles of the invention. In FIG. 6, the receiver 6 comprises a tuner 600; a descrambler 610 having the input thereof connected with the output of the tuner 600; TS (transport stream) processors 620 and 630 having the inputs thereof connected in common to the descrambler 610 output; an MPEG video decoder 640 and an MPEG audio decoder 650 having their inputs connected in common to the TS processor 620 output; a D/A and NTSC converter 660 having its input connected to the MPEG video decoder 640 output; a D/A converter 670 having its input connected to the MPEG audio decoder 650 output; video and audio output devices 680 having their inputs connected respectively to the D/A and NTSC converter 660 output and the D/A converter 670 output; a controller 690 for controlling the tuner 600 and the TS processor 620 through first and second control signals 691 and 692, respectively, on the basis of PSI data from the TS processor 630; a nonvolatile memory connected with the controller 690 for storing EPG data; and a user interface 700 connected with the controller 790 and comprising a display (not shown), a control panel (not shown) and an IC (integrated circuit) card interface (not shown) permitting an IC card 710 to be used. The nonvolatile memory 720 may be any suitable memory such as EEPROM (electrically erasable and programmable read only memory). If the receiver 6 is of a type having program (or application) storage capability, a hard disc may preferably be used for the nonvolatile memory 720. The user interface 700 may further

comprise a remote controller interface (not shown) so as to permit the user to operate the receiver 6 by means of a remote controller.

In operation, transport streams (TSs) received from the transmission media is supplied to the tuner 600. The tuner 600 selects one of the TSs which
 5 is specified by the first control signal 691 from the controller 690 and demodulates the selected TS. The demodulated TS from the tuner 600 is descrambled with a key data stored in, for example, the IC card 710 by the descrambler 610 into an MPEG TS, which is supplied to the TS processors 620 and 630. The TS processor 620 extracts, from the MPEG TS, MPEG video and
 10 audio data for a channel specified by the second control signal 692 from the controller 690. The extracted MPEG video data is decoded by the MPEG video decoder 640 and converted into an NTSC signal by the D/A & NTSC converter 660. The extracted MPEG audio data is decoded by the MPEG audio decoder 650 and converted into an analog audio signal by the D/A converter 670. The
 15 NTSC signal and the analog audio signal are supplied to the audio & video output devices 680.

On the other hand, the TS processor 630 extracts the channel ID 310, program guide data 320 and PSI data 330 for the channel specified by the controller 690 (which is identical to the channel selected by the user) from the
 20 MPEG TS from the descrambler 610 and passes the extracted data 310, 320 and 330 to the controller 690. Then the controller 690 examines the CMI 335 of the PSI data 330. If there is no CMI in the PSI data 330, then the controller 690 controls the tuner 600 and the TS processor 620 to receive the channel directly identified by the user-selected channel. If the PSI data 330 includes
 25 CMI 335, then the controller 690 controls the tuner 60 to select the TS including the channel identified as the mapping destination in the CMI 335 and the TS processor 620 to extract the channel from the received TS.

For example, if the channel CH_j is selected by the user in a period from 6:00 to 7:00, then the controller will find, in the PSI data 330, a CMI 335 whose mapping destination is CH_3 (or P3-1) and accordingly sends a code specifying the TS including CH_3 and a code specifying the channel CH_3 to the
 5 tuner 600 and the TS processor 620, respectively. Similarly, if the channel CH_j is selected by the user in a period from 8:35 to 8:50 for example (in FIG. 7), then the controller will find, in the PSI data 330, a CMI 335 whose mapping destination is CH_4 (or P4-3) and accordingly sends a code specifying the TS including CH_4 and a code specifying the channel CH_4 to the tuner 600 and the
 10 TS processor 620, respectively.

In this way, a channel CH_j permits the user to receive programs P3-1, P1-2, P4-3, P1-2, P5-4, P3-4, P2-5, P4-6 and so on as if the programs were actually transmitted via the channel CH_j .

Application Examples of Virtual Channels

15 There are various ways of selecting a series of programs for a virtual channel. Some selecting strategies will be given in the following.

A channel comprising programs of a specialized category such as news, sports or movies can be easily organized from a limited number of ordinary program sources, and vice versa, thereby increasing the number of
 20 channels.

It is also possible to make a channel comprising the most popular or the top-rated programs.

FIG. 9 is a diagram showing an exemplary channel configuration broadcast from a broadcasting center in accordance with the principles of the
 25 invention. In FIG. 9, the channel configuration comprises a lot of channels 90 broadcast from ordinary intention and a plurality of virtual channels 91 having identical contents to each other. The virtual channels 91 are so

arranged that the virtual channels 91 will appear repeatedly in a relatively short period when the channels 90 and 91 are swept by the user. By doing this, the broadcaster can cause the virtual channels 91 such as a promotion channel to be received when the user changes the channels continuously.

- 5 Many widely different embodiments of the present invention may be constructed without departing from the spirit and scope of the present invention. It should be understood that the present invention is not limited to the specific embodiments described in the specification, except as defined in the appended claims.

WHAT IS CLAIMED IS:

1. A digital broadcasting system capable of causing one of physical channels selected by a broadcaster to be received as one of the channels available to users which is different from the physical channel selected by the
 5 broadcaster; the system comprising:

means for storing, for each of programs of each of said channels available to said users, a program information record comprising PSI (program specific information);

10 means for permitting the broadcaster to include, in said PSI, channel mapping information whose mapping destination is a channel (or a program) to be received instead of the channel for which said program information is intended;

means for inserting said program information records in broadcast transport streams on schedule and, if necessary, immediately after said
 15 broadcaster have included said channel mapping information in said PSI data.

2. A system as defined in claim 1, further comprising:

means, responsive to a determination that PSI data for said program to be received includes channel mapping information indicative of a third
 20 channel (or program) to be received, for changing said channel mapping information such that the mapping destination of said channel mapping information is said third channel (or program).

3. A system as defined in claim 1, wherein:

25 said program information record further comprises channel ID of said channel selected by said user and program guide data for either the program for which said program information record is intended for or the program

identified by said mapping destination of said channel mapping information of said PSI data depending on whether said PSI includes said channel mapping information, and

the system further comprises means for inserting said program
5 information records in said broadcast transport streams.

4. In a digital broadcasting system in which a broadcasting center provides broadcast services through a plurality of physical channels which actually transmit service programs, a method for causing one of the physical
10 channels selected by a broadcaster to be received as one, of the channels available to users, which is different from the physical channel selected by the broadcaster; the method comprising the steps of:

storing, for each of programs of each of said channels available to said users, a program information record comprising PSI (program specific
15 information);

including, in PSI for a program said broadcaster desires to be received, channel mapping information whose mapping destination is a channel (or a program) to be received instead of the channel for which said program information is intended;

20 inserting said program information records in broadcast transport streams on schedule and, if necessary, immediately after said broadcaster have included said channel mapping information in said PSI data.

5. A method as defined in claim 4, wherein said step of including
25 channel mapping information comprises the step of including channel mapping information whose mapping destination is a top-rated program or a channel transmitting said top-rated program.

6. A method as defined in claim 4, wherein said step of including channel mapping information comprises the step of including channel mapping information whose mapping destination is a program of a specific category or a channel transmitting said program of said specific category.

5

7. A method as defined in claim 4, wherein said step of including channel mapping information comprises the step of, in the event one of the currently broadcast programs enters its highlight stage, including channel mapping information whose mapping destination is said one of the currently broadcast programs or a channel transmitting said one of the currently broadcast programs.

10

8. In a digital broadcasting system in which a broadcasting center provides broadcast services through a plurality of physical channels which actually transmit service programs, a method for causing a sequence of programs selected by a broadcaster from the physical channels to be received as if the sequence of programs were broadcast via a channel selected by a user; the method comprising the steps of:

15

storing, for each program of said channel selected by said user, a program information record comprising PSI (program specific information);

20

including, in each of said PSIs, channel mapping information whose mapping destination is one of said physical channels (or said service programs) to be received as said channel for which said each of said PSIs is intended;

25

inserting each of said program information records in broadcast transport streams on schedule and, if necessary, immediately after including said channel mapping information in said each PSI.

ABSTRACT OF THE DISCLOSURE

A digital broadcasting system capable of causing any of physical channels selected by a broadcaster to be received as one of the channels available to users which is different from the physical channel selected by the
5 broadcaster. For each of programs of each of the channels available to said users, a program information record comprising PSI (program specific information) is stored in a data base. The broadcaster is permitted to include, in the PSI, channel mapping information whose mapping destination is a channel (or a program) to be received instead of the channel for which said
10 program information is intended. The program information records is inserted in broadcast transport streams on schedule and, if necessary, immediately after the broadcaster have included the channel mapping information in the PSI data.

15

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100	2101	2102	2103	2104	2105	2106	2107	2108	2109	2110	2111	2112	2113	2114	2115	2116	2117	2118	2119	2120	2121	2122	2123	2124	2125	2126	2127	2128	2129	2130	2131	2132	2133	2134	2135	2136	2137	2138	2139	2140	2141	2142	2143	2144	2145	2146	2147	2148	2149	2150	2151	2152	2153	2154	2155	2156	2157	2158	2159	2160	2161	2162	2163	2164	2165	2166	2167	2168	2169	2170	2171	2172	2173	2174	2175	2176	2177	2178	2179	2180	2181	2182	2183	2184	2185	2186	2187	2188	2189	2190	2191	2192	2193	2194	2195	2196	2197	2198	2199	2200	2201	2202	2203	2204	2205	2206	2207	2208	2209	2210	2211	2212	2213	2214	2215	2216	2217	2218	2219	2220	2221	2222	2223	2224	2225	2226	2227	2228	2229	2230	2231	2232	2233	2234	2235	2236	2237	2238	2239	2240	2241	2242	2243	2244	2245	2246	2247	2248	2249	2250	2251	2252	2253	2254	2255	2256	2257	2258	2259	2260	2261	2262	2263	2264	2265	2266	2267	2268	2269	2270	2271	2272	2273	2274	2275	2276	2277	2278	2279	2280	2281	2282	2283	2284	2285	2286	2287	2288	2289	2290	2291	2292	2293	2294	2295	2296	2297	2298	2299	2300	2301	2302	2303	2304	2305	2306	2307	2308	2309	2310	2311	2312	2313	2314	2315	2316	2317	2318	2319	2320	2321	2322	2323	2324	2325	2326	2327	2328	2329	2330	2331	2332	2333	2334	2335	2336	2337	2338	2339	2340	2341	2342	2343	2344	2345	2346	2347	2348	2349	2350	2351	2352	2353	2354	2355	2356	2357	2358	2359	2360	2361	2362	2363	2364	2365	2366	2367	2368	2369	2370	2371	2372	2373	2374	2375	2376	2377	2378	2379	2380	2381	2382	2383	2384	2385	2386	2387	2388	2389	2390	2391	2392	2393	2394	2395	2396	2397	2398	2399	2400	2401	2402	2403	2404	2405	2406	2407	2408	2409	2410	2411	2412	2413	2414	2415	2416	2417	2418	2419	2420	2421	2422	2423	2424	2425	2426	2427	2428	2429	2430	2431	2432	2
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A DATABASE OF BROADCASTING PROGRAMS	DBMS FOR THE DATABASE	PSI AND SI/EPG DATA COMPILER	• • • •
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FIG. 3

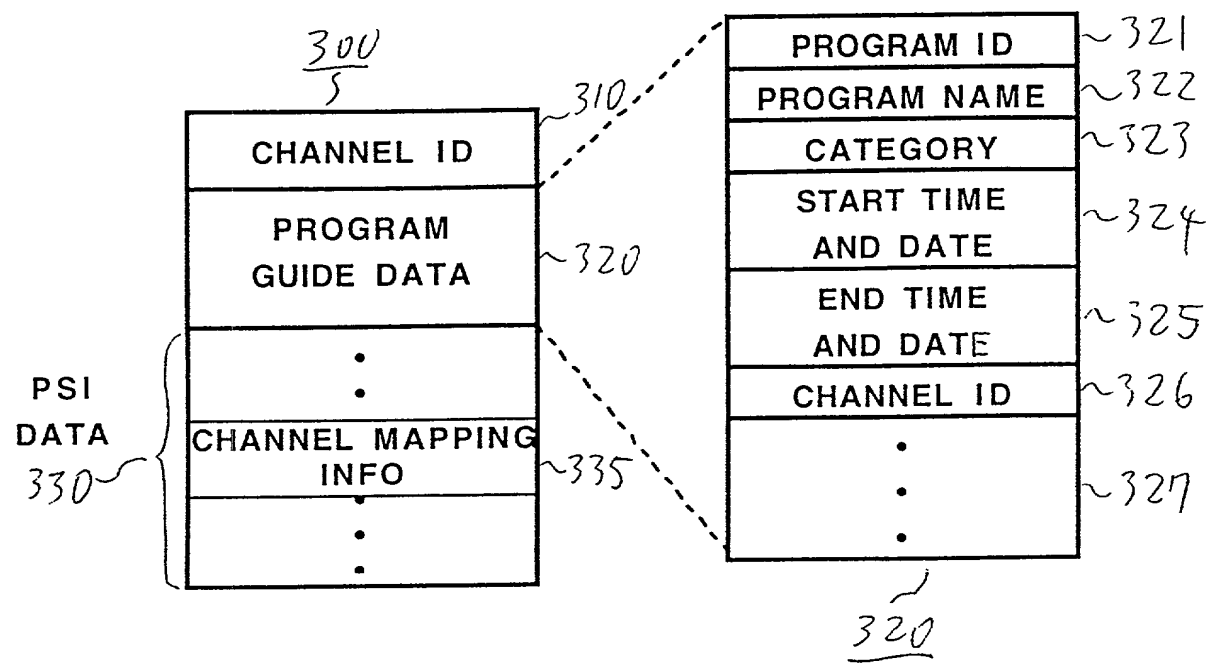


FIG. 4

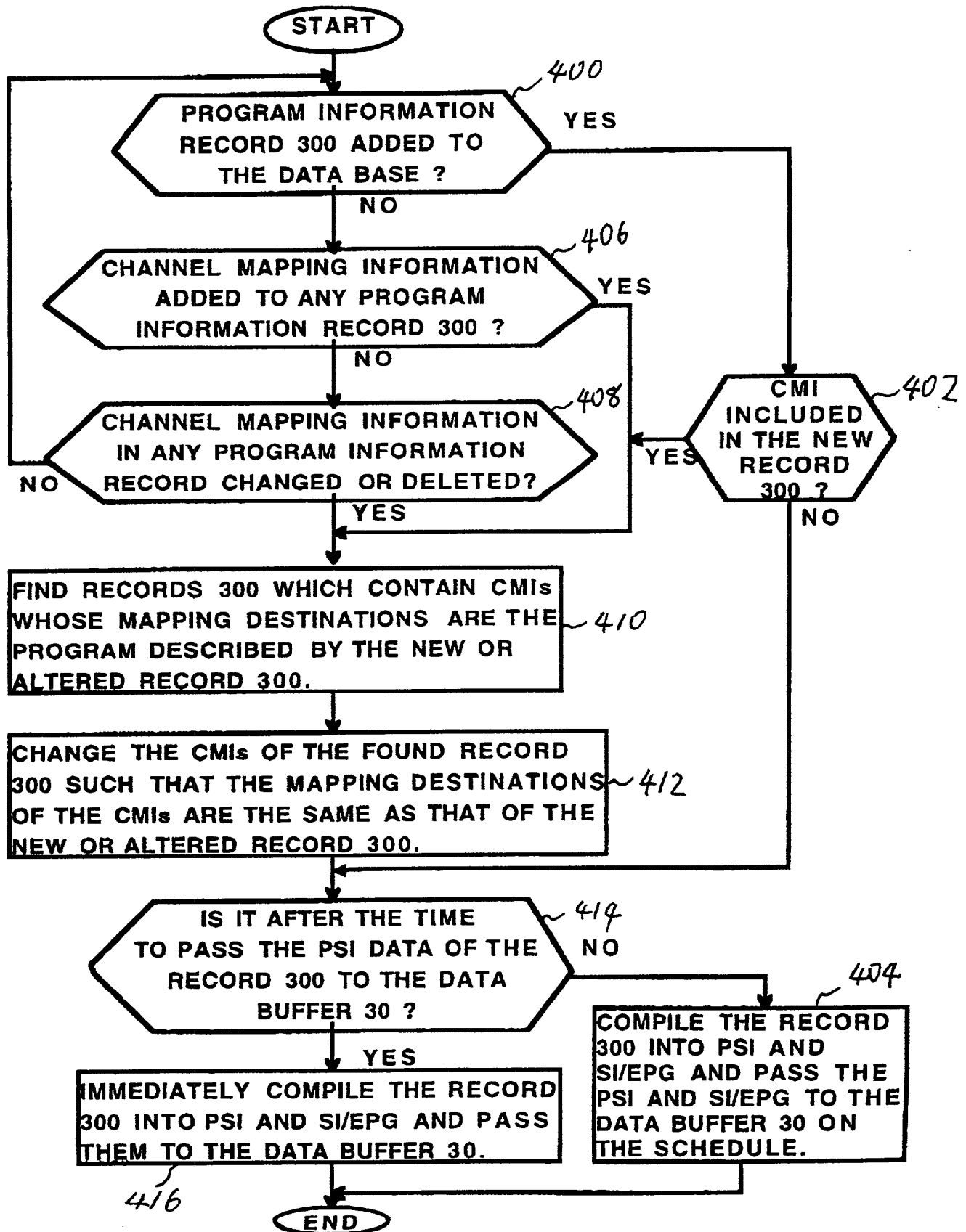
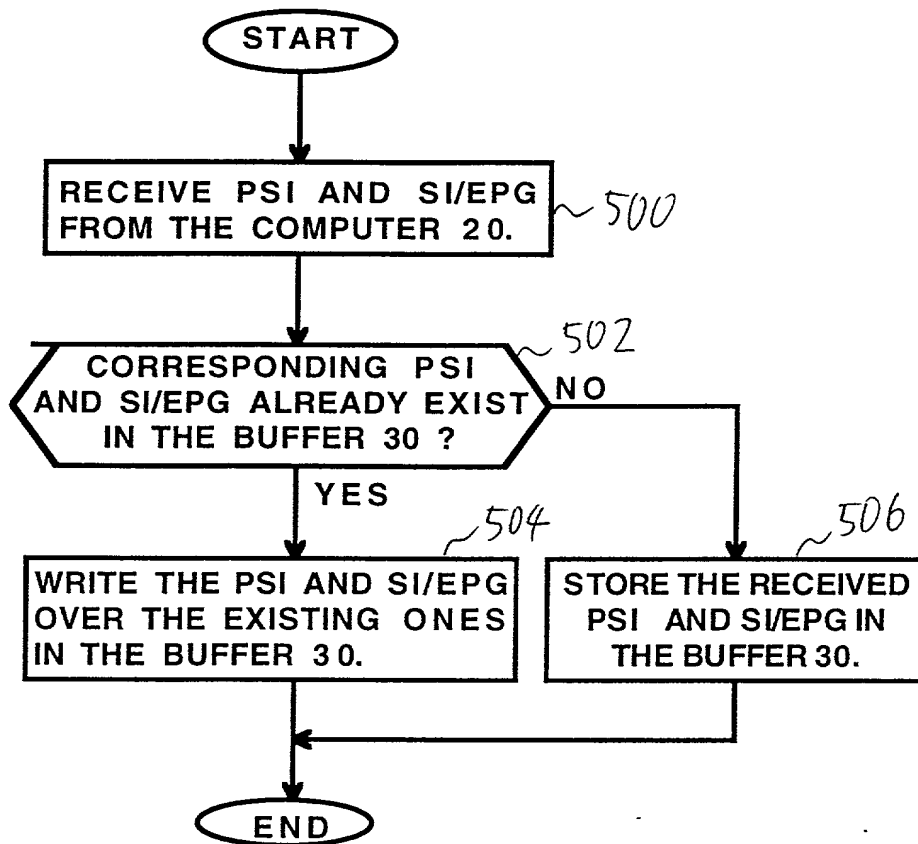


FIG. 5



$$\frac{5}{8}$$

FIG. 7

HOUR
ASSIGNMENT
FOR CH_j

Pj-1	Pj-2	Pj-3	Pj-4	Pj-5	Pj-6
P1-1	P1-2	P1-3	P1-4	P1-5	P1-6
P2-1	P2-2	P2-3	P2-4	P2-5	P2-6
P3-1	P3-2	P3-3	P3-4	P3-5	
P4-1	P4-2	P4-3	P4-4	P4-5	P4-6
P5-1	P5-2	P5-3	P5-4	P5-5	P5-6
PM-1	PM-2	PM-3	PM-4	PM-5	PM-6
TIME					
6:00	7:00	8:00	9:00	10:00	11:00
P3-1	P1-2	P4-3	P5-4	P3-4	P2-5
					P4-6

PROGRAMS
RECEIVED VIA
CH_j

FIG. 8

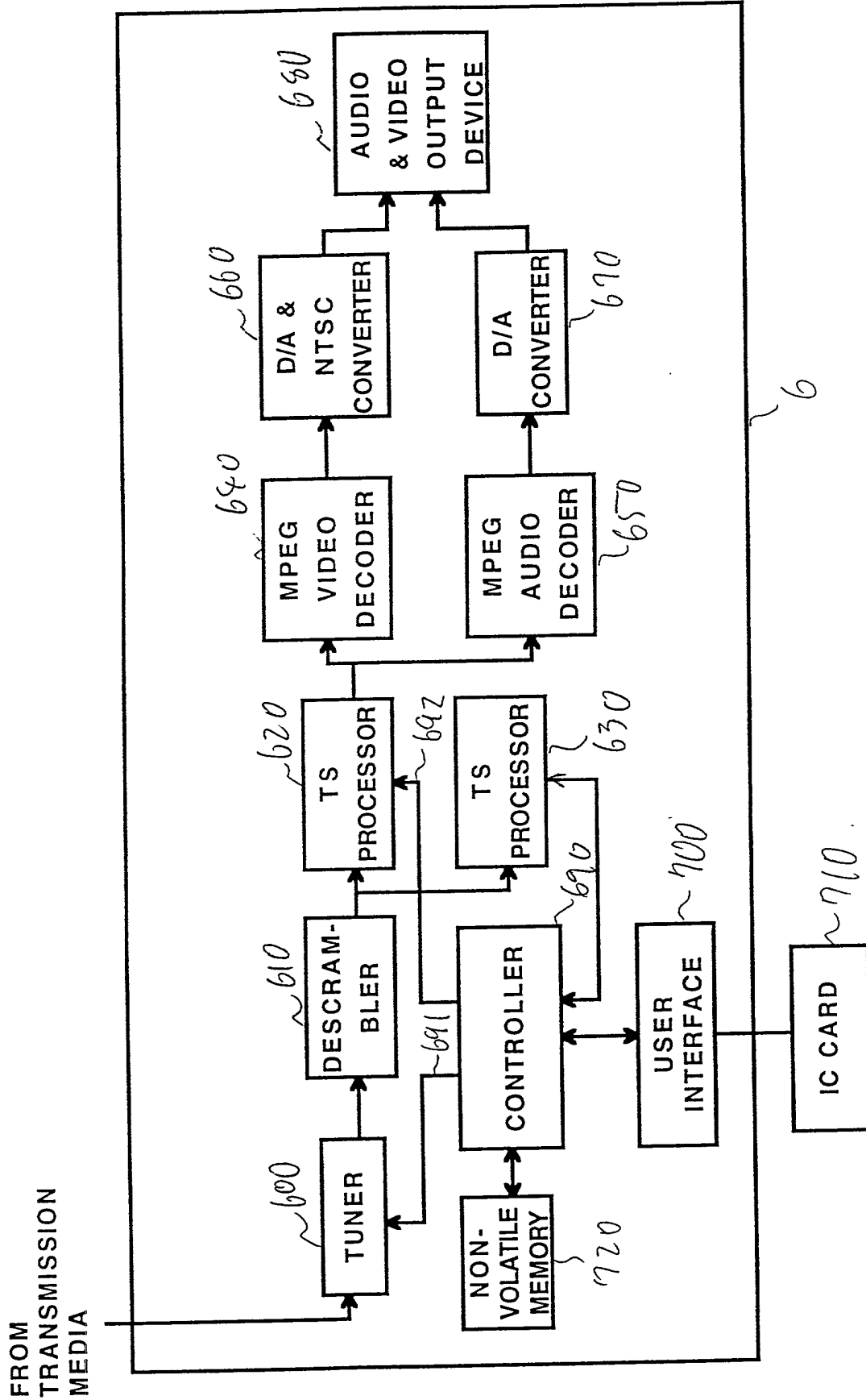
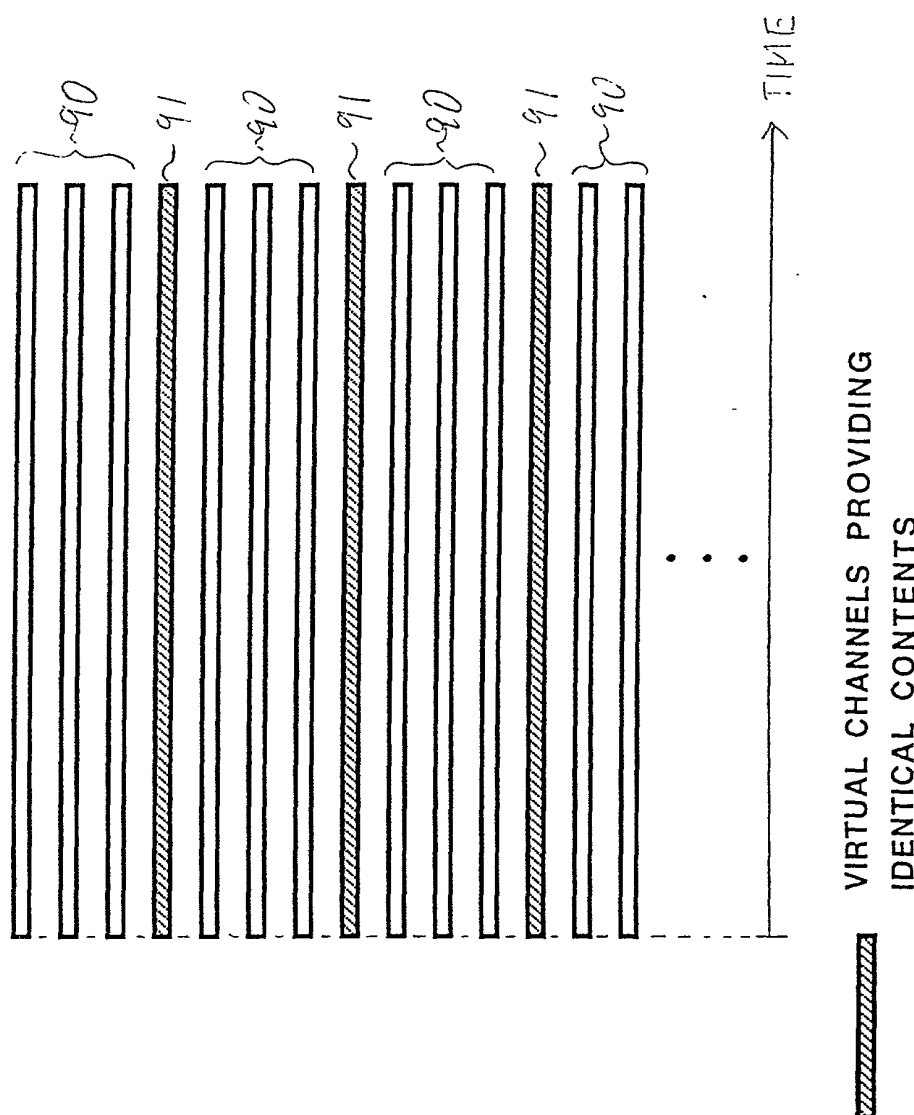


FIG. 9



Docket No.: _____

DECLARATION AND POWER OF ATTORNEY

As a below named inventor, I hereby declare that:

My residence, post office and citizenship are as stated below next to my name,

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter claimed and for which a patent is sought on the invention entitled DIGITAL BROADCASTING SYSTEM USING VIRTUAL CHANNELS, the specification of which ☒ is attached hereto ☐ was filed on _____ as Application Serial No. _____ and was amended on _____ (if applicable)

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is known to me to be material to patentability in accordance with Title 37, Code of Federal Regulations, Section 1.56(a).

I hereby claim foreign priority benefits under Title 35, United States Code, Section 119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

Prior Foreign Application(s):			Priority Claimed	
Number	Country	Day/Month/Year filed	Yes	No
8-279756	Japan	October 23, 1996	X	

I hereby claim the benefit under Title 35, United States Code, Section 120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, Section 112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, Section 1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

Prior U. S. Application(s):		
Serial No.	Filing Date	Status: Patented, Pending, Abandoned

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

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with full power of substitution and revocation, to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith, and all future correspondence should be addressed to them.

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Date: Sept. 24, 1997

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Inventor's signature:

Date:

Residence:

Citizenship:

Post Office Address:

Full name of sixth joint inventor:

Inventor's signature:

Date:

Residence:

Citizenship:

Post Office Address:
